

High-Spatial-Resolution Near-Infrared Absolute Photometric imaging of the Uranian and Neptunian Systems

Division for Planetary Sciences

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We report the first absolutely-calibrated near-infrared high-spatial resolution imagery of Neptune and Uranus, its rings, and four satellites, as observed Aug 10, 11 1995 with NSF/CAM at the NASA/IRTF. Of special interest, near-infrared absolute reflectivities are reported for three large meteorological features ("spots") observed on Neptune; the east, west, north, and south ansae of the wide-open Uranian ring system; and for the latitudinally-varying cloud structure on Uranus. Results are reported for J, H, and K filters near 1.26, 1.62, and 2.21 μm , two special $\sim 0.15\text{-}\mu\text{m}$ -wide filters placed at 1.73 and 2.27 μm , and, for the Uranian system, at 1.59 and 2.50 μm . For Neptune, we find one northern and two southern "bright spots", the latter two co-located near $45\pm 10^\circ$ S. lat, and the much brighter (factor of 2 in the 1.73- μm methane band; factor of 2.5-3 in K and 2.27 μm) northern feature located near $30 \pm 15^\circ$ N lat at the N. limb. This feature's enhanced brightness at the limb ($I/F \sim 0.002$ at 2.27 μm , i.e., similar to the stratospheric S19 features on less-methane-absorbing Jupiter) strongly suggests it is at least partly situated within the stratosphere. The Uranian rings exhibit a puzzling east/west asymmetry in brightness at all observable wavelengths, with the eastern ansae outshining the western ansae by 80-100%. The Lambert-surface-modelled I/F for the average-looking Northern ansae remains fairly constant from J (1.26 μm) through 2.27 μm at $I/F = 0.000204 \pm 0.00005$. The southern polar region of Uranus is particularly bright in J, H, and 1.59 μm due to enhancement of tropospheric aerosols, while deep methane band imagery shows a uniform-to-limb brightened symmetrical disk, suggesting little latitudinal variability in stratospheric haze structure. The low albedo of Uranus (the relatively-bright S. pole exhibits a maximum albedo of $I/F = 0.14$ at the 1.59- μm continuum wavelength) suggests that the ~ 3 -bar-level clouds marking the bottom of the visible atmosphere are actually optically thin in the near-infrared, and perhaps at CCD-nir wavelengths as well.

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